UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 09/851,839 | 05/09/2001 | Binqiang Shi | B-3945 617918-2 | 3945 |

7590 07/25/2002

Richard P. Berg, Esq.
c/o LADAS & PARRY
Suite 2100
5670 Wilshire Boulevard
Los Angeles, CA 90036-5679

| EXAMINER | |
|---|---|
| SONG, MATTHEW J | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1765 | 4 |

DATE MAILED: 07/25/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

| Office Action Summary | Application No. | Applicant(s) |
|---|---|---|
| | 09/851,839 | SHI, BINQIANG |
| | Examiner | Art Unit |
| | Matthew J Song | 1765 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-38 is/are pending in the application.

4a) Of the above claim(s) 34-38 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-33 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 09 May 2001 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

## DETAILED ACTION

### *Election/Restrictions*

1. Claims 34-38 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 3.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-9 and 25-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Hayakawa et al (US 4,824,518).

In a method of producing semiconductor lasers (col 3, ln 25-55), Hayakawa et al discloses a molecular beam apparatus (MBE), where a GaAs substrate in a pre-treatment chamber is heated to about 600°C during a radiation treatment by an $As_4$ molecular beam with about $10^{-6}$-$10^{-5}$ torr and is allowed to stand at about 600°C for about 10 minutes, after which the temperature of the GaAs substrate is lowered to 200°C or less during a radiation treatment by the $As_4$ molecular beam, thereby achieving complete removal of a oxidized film from on the GaAs substrate (col 4, ln 25-55), this reads on applicant's cleansing of a surface of the first crystal by thermal desorption. Hayakawa et al also discloses radiation with the As molecular beam is

contined after the temperature of the GaAs substrate is lowered, so as to positively deposit the As on the GaAs substrate and the deposited As is completely evaporated by a heating process prior to epitaxial growth (col 4, ln 60-67 and col 5, ln 1-2). Hayakawa et al also discloses the pre-treatment chamber can contain Ga cells in addition to the As cells, where after the removal of the oxidized film from the surface of the substrate, a GaAs buffer layer is grown on the substrate is grown on the substrate in the pretreatment chamber and then the substrate is carried into the growth chamber in which crystal growth is carried out on the buffer layer (col 6, ln 10-26), where the buffer layer reads on applicant's first layer substantially accommodates strain accumulated between the first crystal and the second crystal. Hayakawa et al also discloses after the GaAs substrate is moved to the growth chamber. the GaAs substrate is heated to a temperature of 500°C during a radiation treatment by a P molecular beam and then radiated with molecular beams of In, Al and Ga to start the epitaxial growth of $(Al_xGa_{1-x})_yIn_{1-y}P$ layers thereon and the growth is stated at a relatively low temperature and after the growth begins, the temperature is gradually raised to the optimum level of 600°C (col 5, ln 3-30).

Referring to claim 2, Hayakawa et al discloses heating to 600°C under a $As_4$ flux of $10^{-6}$-$10^{-5}$ torr and annealing for 10 minutes.

Referring to claim 3, Hayakawa et al discloses a pressure of $10^{-5}$ torr (0.0013 Pa), this reads on applicant's about 0.004 Pa.

Referring to claim 4, Hayakawa et al discloses a first crystal of GaAs and a desorption vapor of As.

Referring to claim 5, Hayakawa et al discloses a first crystal of GaAs and a desorption vapor of $As_4$.

Referring to claim 6, Hayakawa et al discloses As deposits on a GaAs substrate at a temperature of 200°C, this reads on applicant's condenses on the surface of the first crystal and the As layer is completely evaporated in a step prior to epitaxial growth, this reads on varying thickness of the first layer by varying temperature.

Referring to claim 7, Hayakawa et al discloses the first vapor is introduced at 200°C and the optimal temperature of epitaxial growth is 600°C.

Referring to claim 8, Hayakawa et al discloses a first crystal of GaAs and a first material of As.

Referring to claim 9, Hayakawa et al discloses a first crystal of GaAs and a first material of $As_4$.

Referring to claim 25-26, Hayakawa et al discloses a method of producing a semiconductor laser, this reads on applicant's used in optoelectronics.

Referring to claim 27, Hayakawa et al discloses deposited an As layer and depositing Ga to form a GaAs buffer layer after thermal desorption of the substrate.

Referring to claim 28, Hayakawa et al discloses a GaAs buffer layer this reads on applicant's accommodating strain between the substrate and the crystal. It is also inherent to Hayakawa et al to have a frist layer which accomadates strain between a substrate and a crystal during epitaxial growth because Hayakawa discloses the same method of depositing the same first layer as applicant.

Referring to claim 29, Hayakawa et al discloses a GaAs substrate, a crystal of AlGaInP, a first material of As and a second material of Ga.

4. Claim is are rejected under 35 U.S.C. 102(b) as being anticipated by Ogasawara (US 4,897,367).

Ogasawara discloses a GaAs monomolecular layer from on a Si substrate, where the Si substrate is surface cleaned in an MBE system at a temperature of 1000°C for about 20 minutes (col 2, ln 10-38). Ogasawara also discloses a As cell shutter onto a substrate, the temperature of the substrate is decreased to 60°C-90°C over a period of about 20 minutes and then a Ga cell shutter is irradiated onto the substrate about 1 second in an amount needed to form a GaAs layer (col 2, ln 39-58). Ogasawara also discloses while still irradiating an As beam on the substrate, the temperature of the substrate was increased to 200°C-400°C, where heating results in a change of an amorphous GaAs layer to a single crystal GaAs layer and the As beam is irradiated to prevent out-diffusion of As from the GaAs layer during heating (col 2, ln 59-67). Ogasawara also discloses a GaAs buffer layer is grown at a temperature of 200°C-400°C to allow a GaAs layer to be epitaxially grown thereon at 450°C-580°C.

Referring to claim 1, Ogasawara discloses a first crystal of Si, a first layer of As, a second layer of Ga, and a second crystal of GaAs. Ogasawara also discloses heating to a temperature of 1000°C to clean the surface of the substrate. Ogasawara is silent to the first layer accommodates strain accumulated by the second crystal but it is inherent to Ogasawara to have a first layer which accommodates strain accumulated by the second crystal because he teaches a similar first layer and a similar second crystal grown epitaxially thereon.

## *Claim Rejections - 35 USC § 103*

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa et al (US 4,824,518).

Hayakawa et al teaches all of the limitations of claim 3, as discussed above in claim 2. Hayakawa et al teaches a desorption pressure of 0.0013 Pa, this reads on applicant's about 0.004 Pa. If this is not the case then it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Hayakawa et al by attempting to optimize the pressure by conducting routine experimentation.

Referring to claims 4-5, Hayakawa et al teaches a GaAs first crystal and a $As_4$ desorption vapor.

7. Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa et al (US 4,824,518) in view of Nomura et al (US 5,656,540).

Hayakawa et al teaches all of the limitations of claim 3, as discussed previously in claim 2. Hayakawa et al teaches a desorption vapor pressure of 0.0013 Pa, this reads on applicnat's 0.004 about Pa, but if this is not the case.

In a method of semiconductor crystal growth, Normura et al teaches a GaAs substrate is heated to 620°C under a pressure of $As_4$, where the pressure of $As_4$ is $5x10^{-3}$ Pa, to remove a natural oxide film (col 3, ln 20-35 and col 4, ln 23-37 and col 4, ln 49-60). It would have been

obvious to a person of ordinary skill in the art at the time of the invention to modify Hayakawa et al with Nomura et al because luminescence is improved (col 4, ln 53-60).

Referring to claim 4, the combination of Hayakawa et al and Nomura et al teaches a first crystal of GaAs and a desorption vapor of As.

Referring to claim 5, the combination of Hayakawa et al and Nomura et al teaches a first crystal of GaAs and a desorption vapor of $As_4$.

8. Claims 6-11 and 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa et al (US 4,824,518) in view of Pessa et al (US 4,876,218).

Hayakawa et al discloses all of the limitations of claim 6, as discussed previously above in claim 2, except adjusting the thickness of the first layer by varying a temperature of the first crystal.

In a method of forming a GaAs buffer layer on a GaAs substrate, Pessa et al teaches a growing temperature of 100°-500°C and Ga and As contained in effusions cells and are heated to evaporation temperatures, which are on the order of 300°C (As) and 800°C (Ga), where a shutter is opened in front of a As cell and a vapor beam of $As_4$ molecules is allowed to act on the surface of a substrate for a period of time which is required to form one atom layer and excess arsenic is removed through re-evaporation (col 3, ln 15-50), this reads on applicant's adjusting the thickness of the first layer by varying a temperature of the first crystal. Pessa et al also teaches after the As layer is formed, a vapor beam of Ga atoms is allowed to act on the growing surface until a number of Ga atoms corresponding to a single atom layer reaches the growing surface (col 3, ln 50-65).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Hayakawa et al with Pessa et al because the growing surface grows by one atom layer only with good crystallographic properties (col 1, ln 55-65).

Referring to claim 7, the combination of Hayakawa et al and Pessa et al discloses the first vapor is introduced at 200°C and the optimal temperature of epitaxial growth is 600°C.

Referring to claim 8, the combination of Hayakawa et al and Pessa et al discloses a first crystal of GaAs and a first material of As.

Referring to claim 9, the combination of Hayakawa et al and Pessa et al discloses a first crystal of GaAs and a first material of $As_4$.

Referring to claim 10, the combination of Hayakawa et al and Pessa et al discloses a first layer is an atom layer, this reads on applicant's few angstroms to approximately a few tens of angstroms.

Referring to claim 11, the combination of Hayakawa et al and Pessa et al teaches a shutter is opened allowing a first vapor to act on the surface of the substrate.

Referring to claim 30, the combination of Hayakawa et al and Pessa et al discloses a first layer is an atom layer, this reads on applicant's few angstroms to approximately a few tens of angstroms.

Referring to claim 31, the combination of Hayakawa et al and Pessa et al discloses an atom layer of Ga atoms.

9. Claims 12-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa et al (US 4,824,518) in view of Pessa et al (US 4,876,218) as applied to claim 6 above, and further in view of Ogasawara (US 4,897,367).

The combination of Hayakawa et al and Pessa et al teaches all of the limitations of claim 12, as discussed above in claim 6, including heating the second layer to an epitaxial growth temperature of 600°C. The combination of Hayakawa et al and Pessa et al does not teach annealing under a pressure of the first vapor of about 0.008 Pa.

In a process of growing gallium arsenide on a silicon substrate, Ogasawara teaches a GaAs monomolecular layer from on a Si substrate, where the Si substrate is surface cleaned in an MBE system at a temperature of 1000°C for about 20 minutes (col 2, ln 10-38). Ogasawara also discloses a As effusion cell shutter is opened to irradiate As onto a substrate, the temperature of the substrate is decreased to 60°C-90°C over a period of about 20 minutes and then a Ga effusion cell shutter opened to irradiate Ga onto the substrate about 1 second in an amount needed to form a GaAs layer (col 2, ln 39-58). Ogasawara also discloses while still irradiating an As beam on the substrate, the temperature of the substrate was increased to 200°C-400°C, where heating results in a change of an amorphous GaAs layer to a single crystal GaAs layer and the As beam is irradiated to prevent out-diffusion of As from the GaAs layer during heating (col 2, ln 59-67). Ogasawara also discloses a GaAs buffer layer is grown at a temperature of 200°C-400°C to allow a GaAs layer to be epitaxially grown thereon at 450°C-580°C. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Hayakawa et al and Pessa et al with Ogasawara because a pressure of As prevents out-diffusion from the GaAs layer

Referring to claim 12, the combination of Hayakawa et al, Pessa et al and Ogasawara teaches a pressure of the first vapor is 0.0013 Pa, where this reads on applicant's pressure of 0.008 Pa, if this is not the case then it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Hayakawa et al, Pessa et al and Ogasawara by attempting to optimize the pressure of the first vapor by conducting routine experimentation because the vapor pressure is a result effective variable as taught by Ogasawara.

Referring to claim 13, the combination of Hayakawa et al, Pessa et al and Ogasawara teaches the second layer is an atom layer, this reads on applicant's mono-layer of atoms.

Referring to claim 14, the combination of Hayakawa et al, Pessa et al and Ogasawara teaches an effusion cell, this reads on applicant's furnace containing a second vapor. The combination of Hayakawa et al, Pessa et al and Ogasawara also teaches a shutter opens to allow the second vapor to contact the substrate.

Referring to claim 15, the combination of Hayakawa et al, Pessa et al and Ogasawara teaches a first crystal of GaAs, a first material of As and a second material of Ga.

Referring to claim 16, the combination of Hayakawa et al, Pessa et al and Ogasawara teaches the second vapor of Ga has a temperature of 800°C, this reads applicant's about 900°C. The combination of Hayakawa et al, Pessa et al and Ogasawara is silent to the pressure of second vapor. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Hayakawa et al, Pessa et al and Ogasawara by attempting to optimize the pressure of the second vapor by conducting routine experimentation because pressure is a result effective variable.

Referring to claim 17, the combination of Hayakawa et al, Pessa et al and Ogasawara teaches a second material forms a second layer of GaAs and the second crystal is AlGaInP, this reads on applicant's the ratio of the second material is substantially equal to the ratio of the elements forming the second crystal.

Referring to claim 18, the combination of Hayakawa et al, Pessa et al and Ogasawara teaches 1 second.

Referring to claim 19, the combination of Hayakawa et al, Pessa et al and Ogasawara teaches the second shutter is open for 1 second and a monolayer of group III atoms. It is inherent to the combination of Hayakawa et al, Pessa et al and Ogasawara to have a monolayer wherein the number per surface are of group-III forming the monolayer is about 6.5e14 $cm^{-2}$ because the combination of Hayakawa et al, Pessa et al and Ogasawara teaches a similar method of depositing a group-III monolayer. The combination of Hayakawa et al, Pessa et al and Ogasawara does not teach the second shutter is opened for 2.2 seconds. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Hayakawa et al, Pessa et al and Ogasawara by attempting to optimize the time the shutter is opened by conducting routine experimentation because the time the shutter is open is a result effective variable.

Referring to claim 20, the combination of Hayakawa et al, Pessa et al and Ogasawara teaches a monolayer, this reads on a few angstoms to a few tens of angstroms.

Referring to claim 21, the combination of Hayakawa et al, Pessa et al and Ogasawara teaches an epitaxial growth of AlGaInP, where Al, Ga, In and P are introduced into a growth chamber at an optimal temperature for epitaxial growth.

Referring to claim 22, the combination of Hayakawa et al, Pessa et al and Ogasawara teaches shutters.

10. Claims 23-24 and 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa et al (US 4,824,518) in view of Pessa et al (US 4,876,218) along with Ogasawara (US 4,897,367) as applied to claims 12-22 above, and further in view of Grunthaner et al (US 5,094,974).

The combination of Hayakawa et al, Pessa et al and Ogasawara teaches all of the limitations of claim 23, as discussed above in claim 22, except the ratio of the group-V flux to the group-III flux is substantially in the range of 1.5 to about 3.

In a method growing group III-V films by control of MBE growth stoichiometry, Grunthaner et al teaches instantaneous flux ratios of In to As have been critcal to the control of defect generation in the lattice mismatched epitaxy of InAs on GaAs (col 2, ln 25-40). Gruntaner et al also teaches a substrate temperature of 250°C-575°C during deposition of the InAs layer on the GaAs layer (col 4, ln 1-10). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Hayakawa et al, Pessa et al and Ogasawara with Grunthaner by attempting to optimize the ratio of fluxes by conducting routine experimentation because the ratio of fluxes is a result effective variable.

Referring to claim 24, the combination of Hayakawa et al, Pessa et al, Ogasawara and Grunthaner et al teaches InAs.

Referring to claim 32, the combination of Hayakawa et al, Pessa et al, Ogasawara and Grunthaner et al teaches a GaAs substrate is heated to about 600°C during a radiation treatment

by an $As_4$ molecular beam, where $As_4$ is an equivilent source of Asernic to $As_2$, with about $10^{-5}$ torr, 0.0013 Pa, and is allowed to stand at about 600°C for about 10 minutes, where a pressure of 0.013 Pa reads on applicant's 0.008 Pa, but if this is not the case than it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Hayakawa et al, Pessa et al, Ogasawara and Grunthaner et al by attempting to optimize the pressure by conducting routine experimentation because pressure is a result effective variable. The combination of Hayakawa et al, Pessa et al, Ogasawara and Grunthaner et al also teaches lowering the temperature to 100°C-500°C, whereby an atom layer of As is formed and excess arsenic is removed through re-evporation, where the evaporation temperature of As is 300°C. The combination of Hayakawa et al, Pessa et al, Ogasawara and Grunthaner et al teaches an evaporation temperature of 300°C, this reads on applicant's temperature of about 250°C, but if this is not the case then it would have been obvious to a person of ordinary skill in the art at the time of the invention the combination of Hayakawa et al, Pessa et al, Ogasawara and Grunthaner et al by attempting to optimize the evaporation temperature by conducting routine experimentation because temperature is a result effective variable. The combination of Hayakawa et al, Pessa et al, Ogasawara and Grunthaner et al is silent to the In vapor is introduced at a temperature of 790°C, but it is inherent to the combination of Hayakawa et al, Pessa et al, Ogasawara and Grunthaner et al to have the In vapor introduced because the evaporation temperature of Indium is about 790°C. The combination of Hayakawa et al, Pessa et al, Ogasawara and Grunthaner et al teaches annealing at 400°C under $As_4$ vapor and wherein epitaxial growth of InAs.

Referring to claim 33, the combination of Hayakawa et al, Pessa et al, Ogasawara and Grunthaner et al teaches the epitaxial growth of InAs by introducing a flux of In vapor and a flux of As vapor and maintaining a temperature of 250°-575°C. It would have been obvious to a person of ordinary skill in the art at the time of the invention is silent to the ratio of the fluxes is maintained at 2.5. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Hayakawa et al, Pessa et al, Ogasawara and Grunthaner et al by attempting to optimize the ratio of fluxes by conducting routine experimentation because the ratio is a result effective variable.

## *Conclusion*

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Nishikata et al (US 5,432,124) teaches a group V component of a substrate can be effectively prevented from leaving the substrate by evaporating onto the substrtate surface with V molecular beams of the type same as or different from that of V atoms in the substrate in the step of cleaning the substrate and a transition layer is apt to be formed on the interface of he substrate if the pressure of V molecular beams is too high (col 4, ln 40-52).

Chang et al (US 5,294,287) teaches an MBE apparatus where a gallium effusion cell at 998°C and an arsenic cell at 230°C (col 6, ln 1-20).

Kubiak et al (US 4,330,360) teaches group III beam intensities may be regulated by varying the effusion cell temperatures and where noiminal effusion cell temperatures range from

900°C-1000°C for Ga and 800°C-840°C for Indium depending on the effusion cell to substrate distance (col 3, ln 45-67).

Miller (US 4,470,192) teaches a GaAs epilayer on a GaAs subsrate is grown using an $As_2$ or an $As_4$ flux and the As flux prevents surface decomposition (col 2, ln 40-60).

Dobson et al (US 4,575,462) teaches a MBE apparatus with effusion cells each provided with independently operable shutters and an $As_2$ flux of $4x10^{15}$ atoms/cm$^2$/sec and a gallium flux of $1.22x10^{15}$ atoms/cm$^2$/sec are used to grow a GaAs monolayer film on a GaAs substrate, where the ratio between fluxes is 3.2. (col 6, ln 15-60)

Chisholm et al (US 5,221,367) teaches InAs on a GaAs substrate where the ratio of I to $As_4$ and the temperature of the substrate are result effective variables (col 8, ln 1-15).

Cho (US 3,942,624) teaches growth rate is governed by the effusion cell temperature, i.e. the evaporation rate of Ga in the case of GaAs. (col 1, ln 20-50).

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on 703-308-3868. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

mjs
July 22, 2002

BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700